FIG. 1

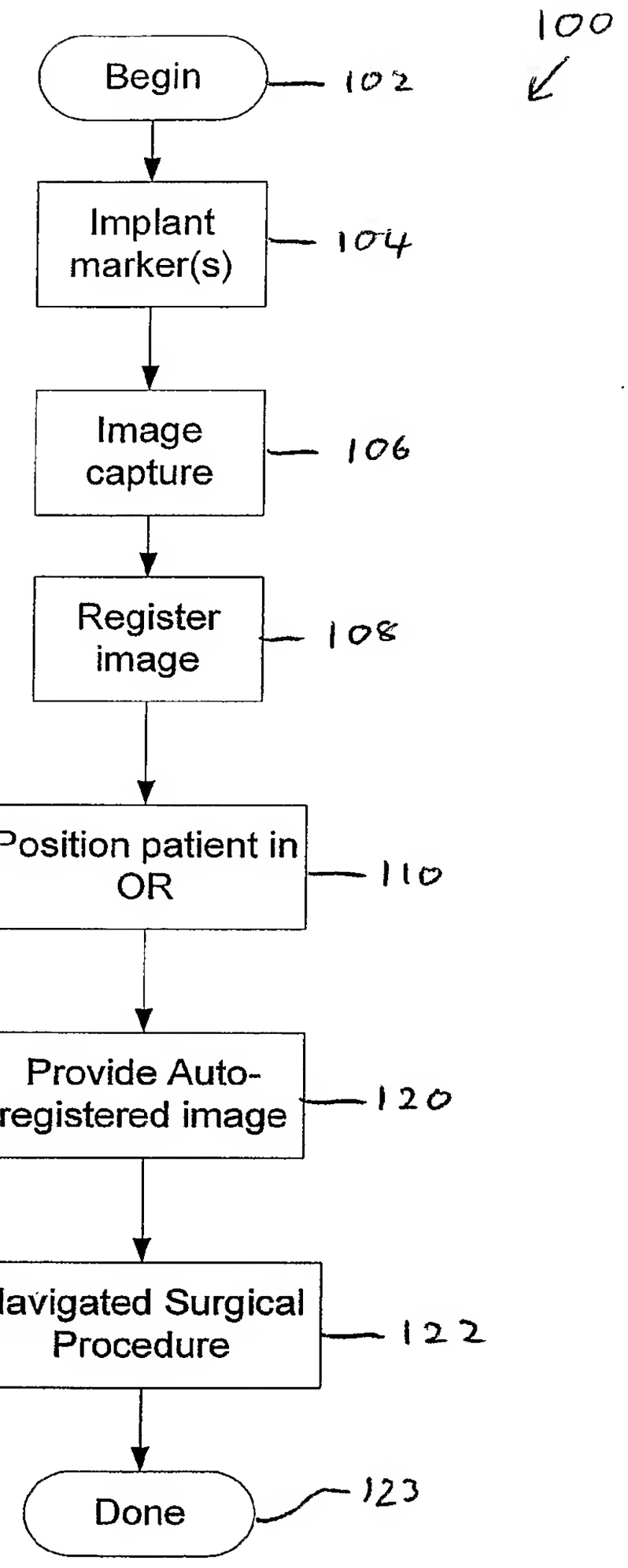

100
Begin
102
Implant marker(s)
104
Image capture
106
Register image
108
Position patient in OR
110
Provide Auto-registered image
120
Navigated Surgical Procedure
122
Done
123

FIG. 2

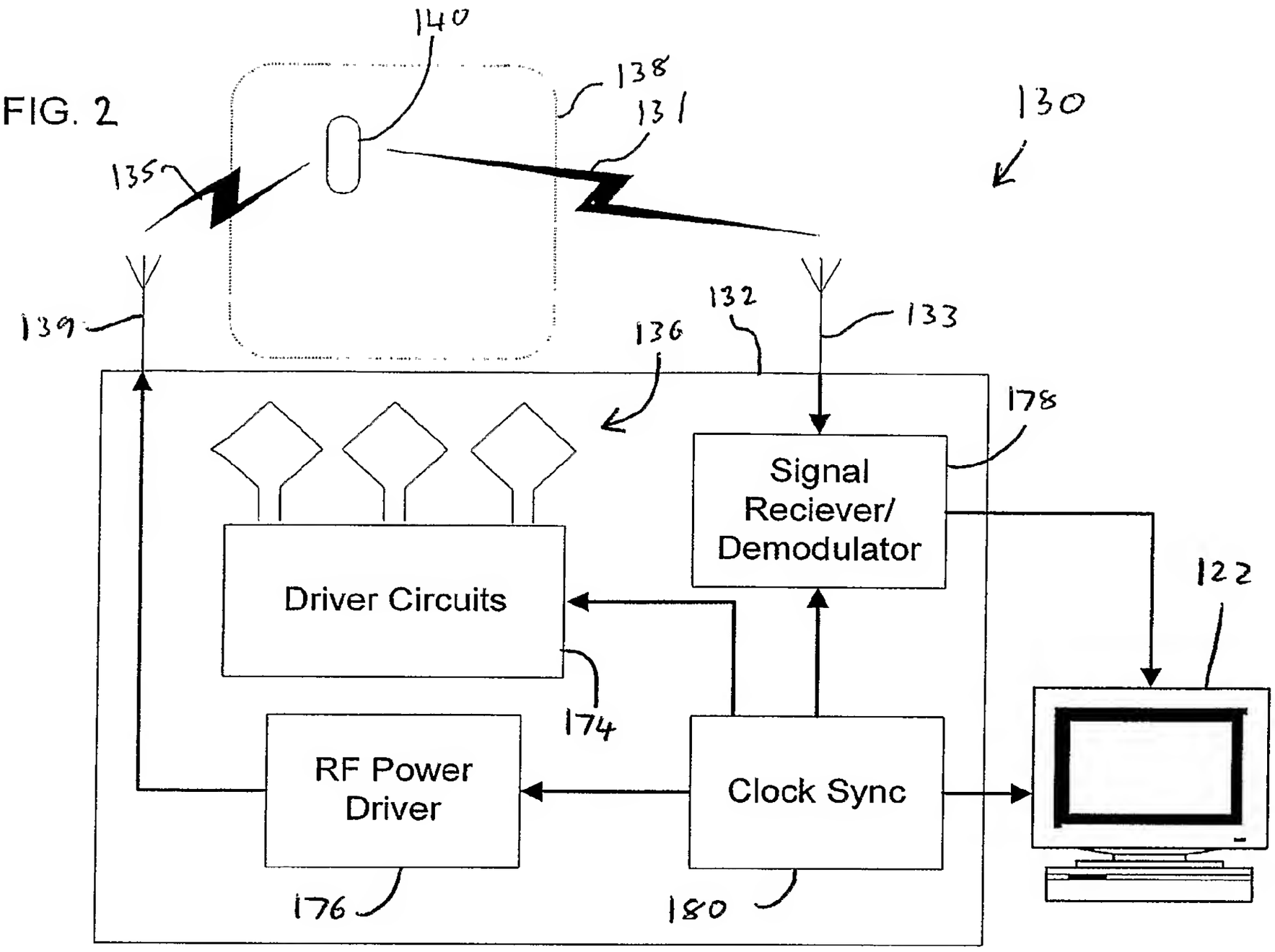


FIG. 3

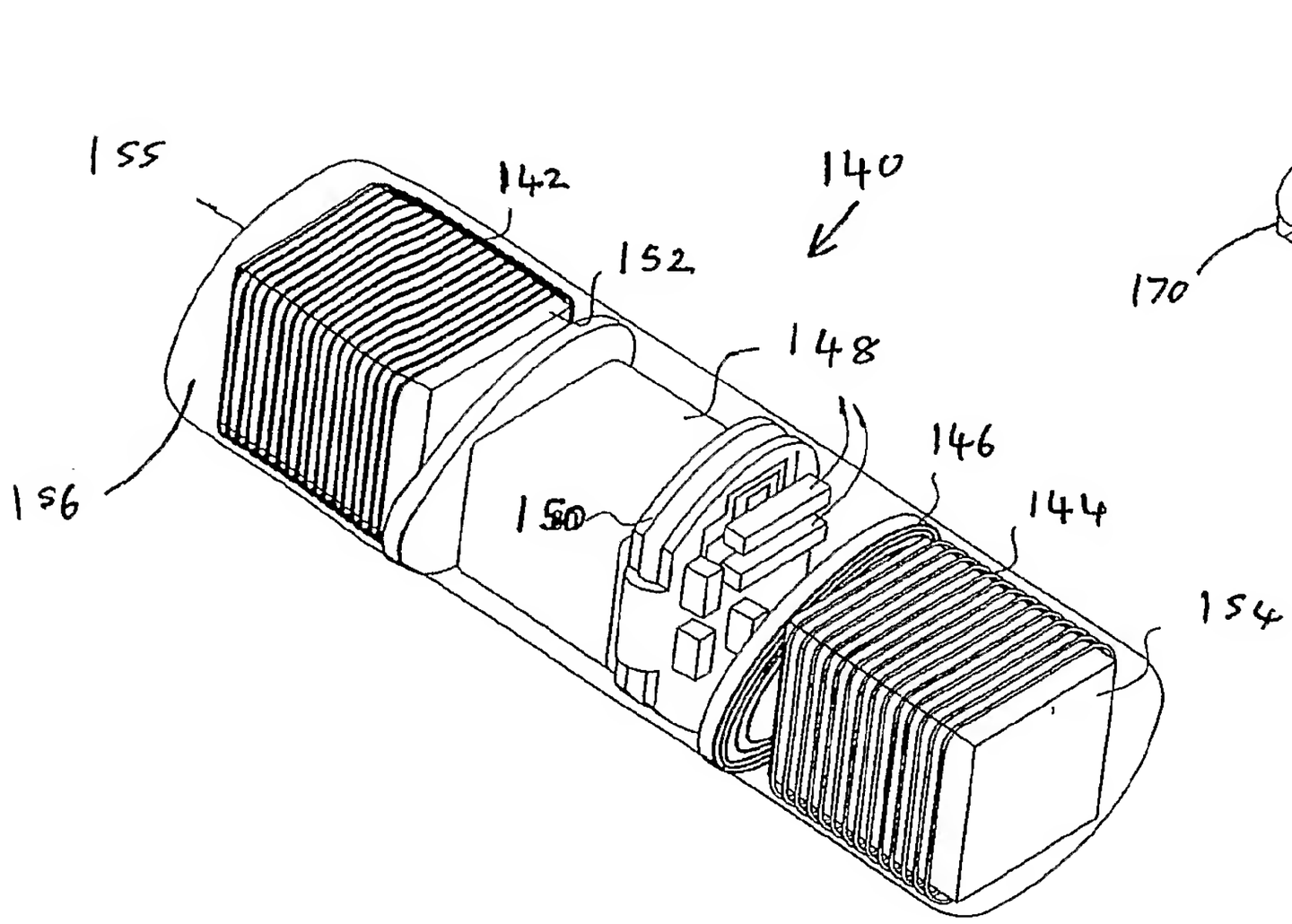


FIG. 4

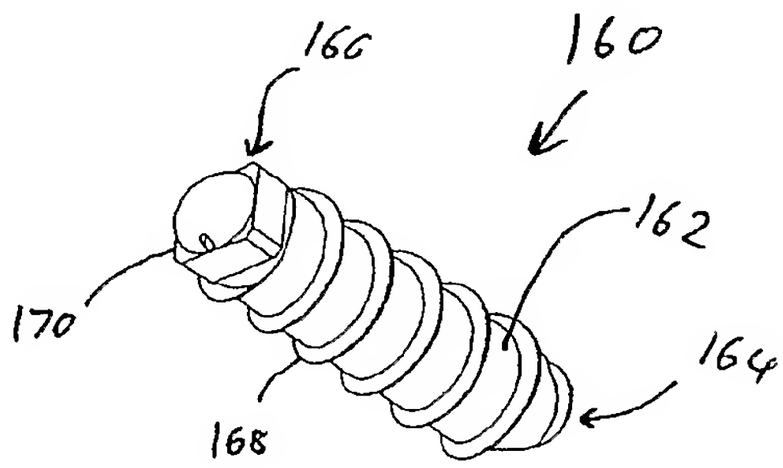


FIG. 5

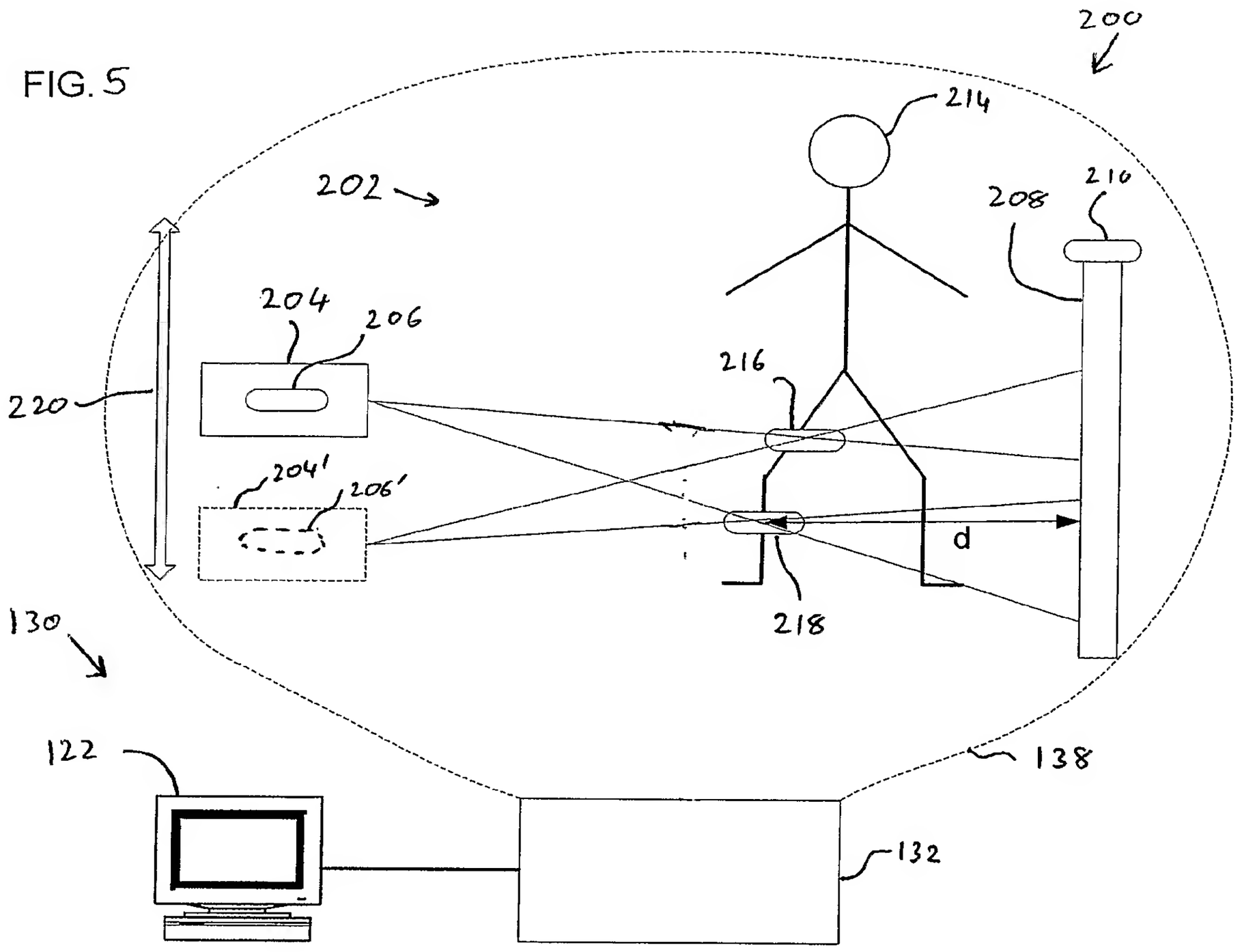

200
214
202
208
210
204
206
216
220
204'
206'
d
218
130
122
138
132

FIG. 6

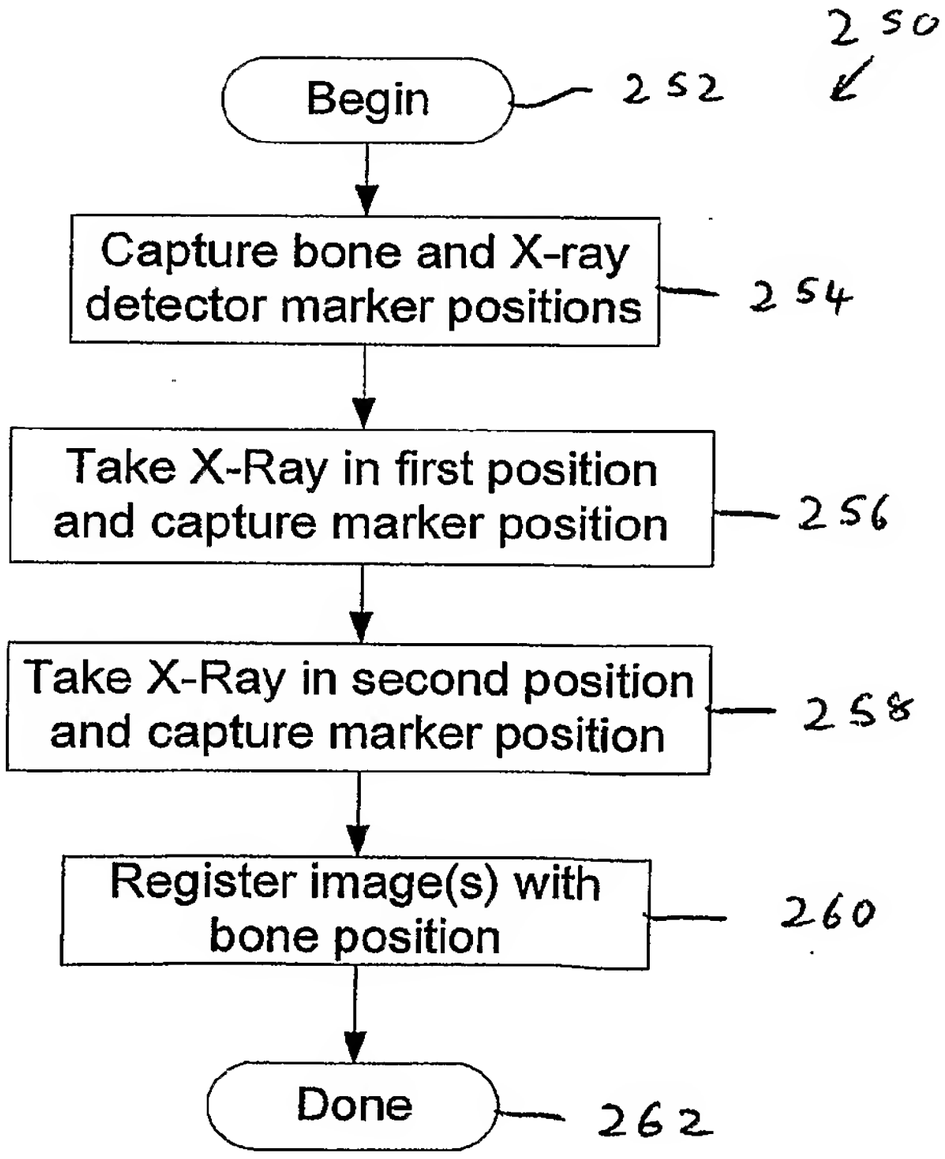

250
Begin
252
Capture bone and X-ray detector marker positions
254
Take X-Ray in first position and capture marker position
256
Take X-Ray in second position and capture marker position
258
Register image(s) with bone position
260
Done
262

FIG. 7

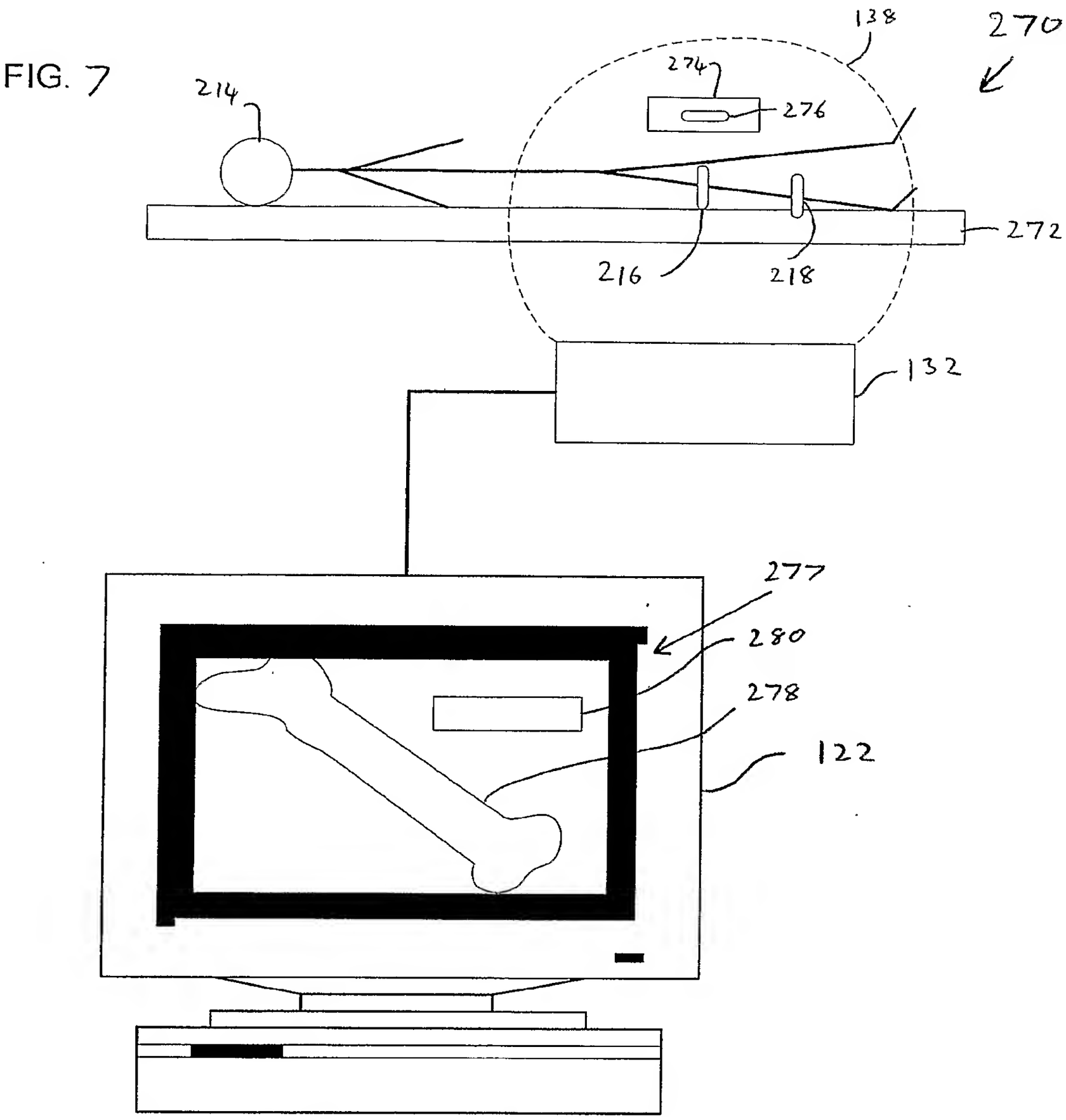


FIG. 8

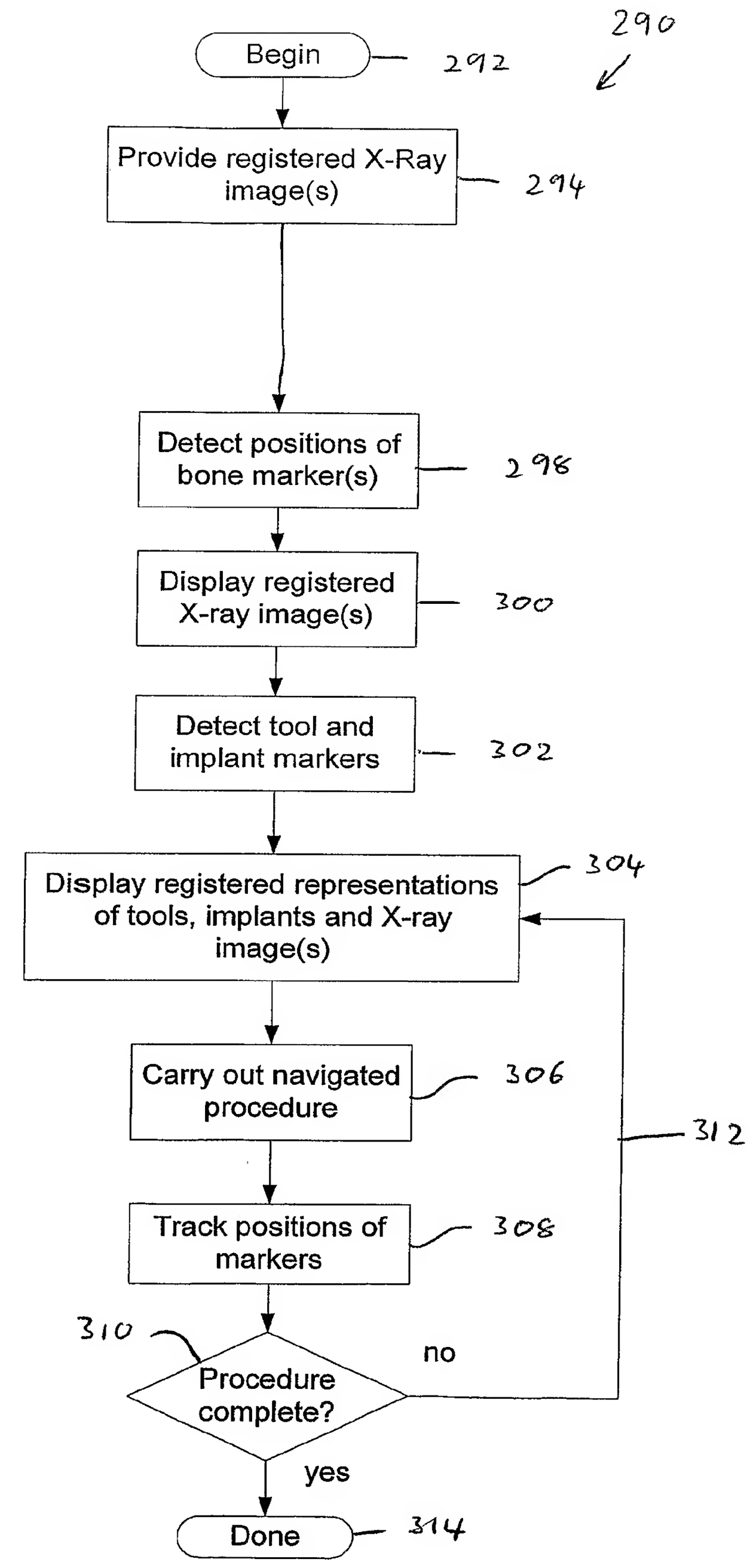

290
Begin
292
Provide registered X-Ray image(s)
294
Detect positions of bone marker(s)
296
Display registered X-ray image(s)
300
Detect tool and implant markers
302
Display registered representations of tools, implants and X-ray image(s)
304
Carry out navigated procedure
306
Track positions of markers
308
310
Procedure complete?
no
312
yes
Done
314

FIG. 9

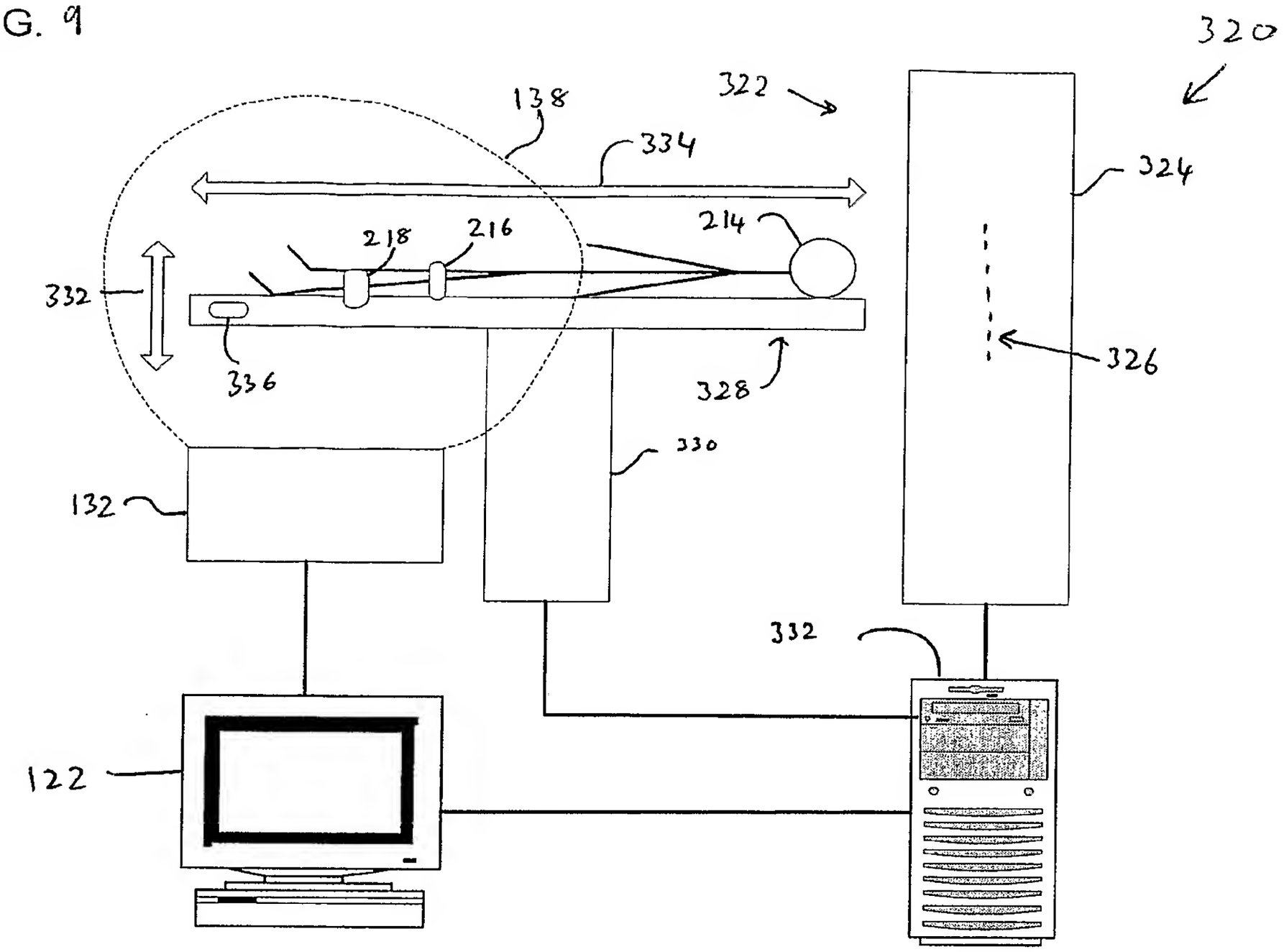


FIG. 10

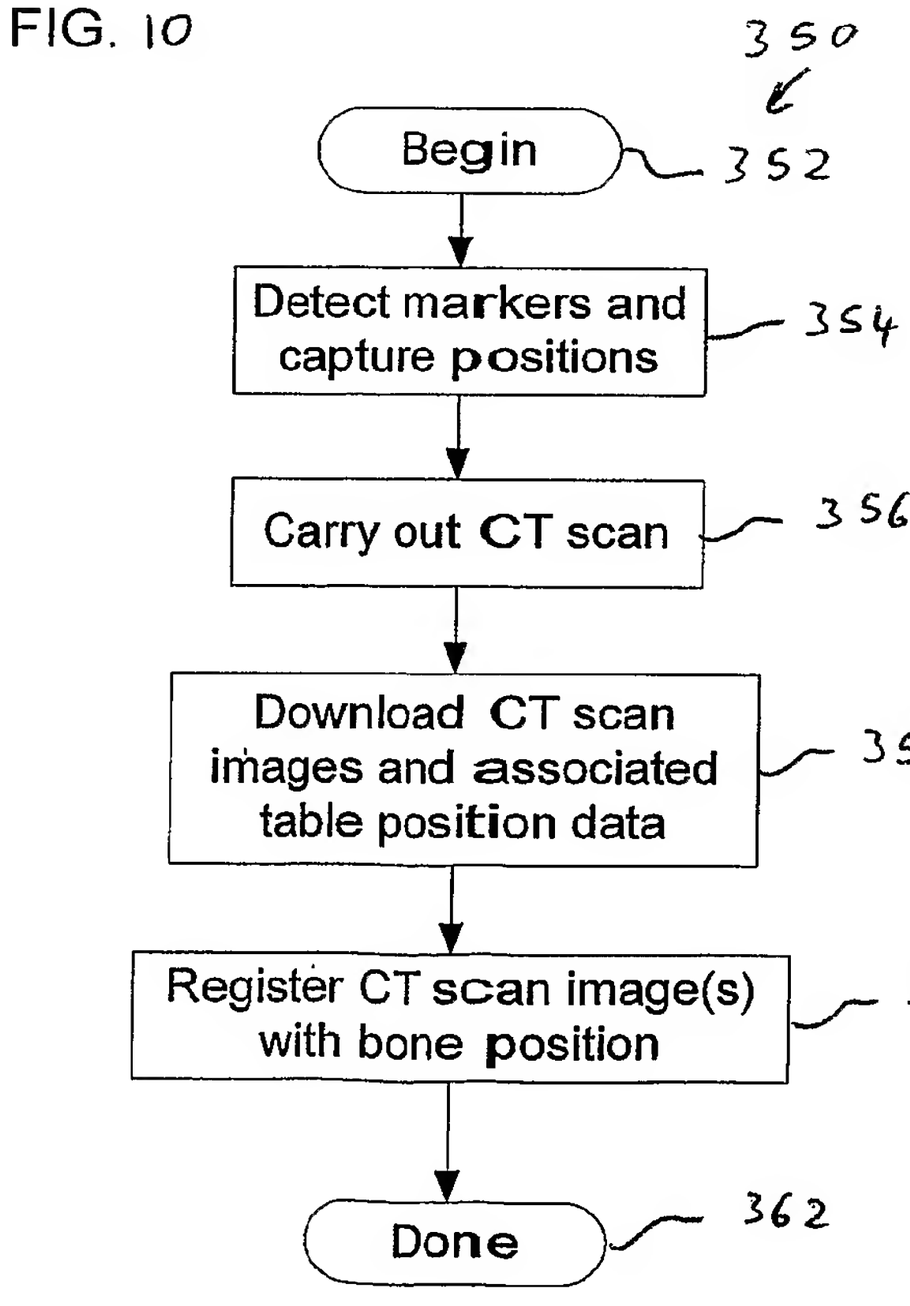


FIG. 11

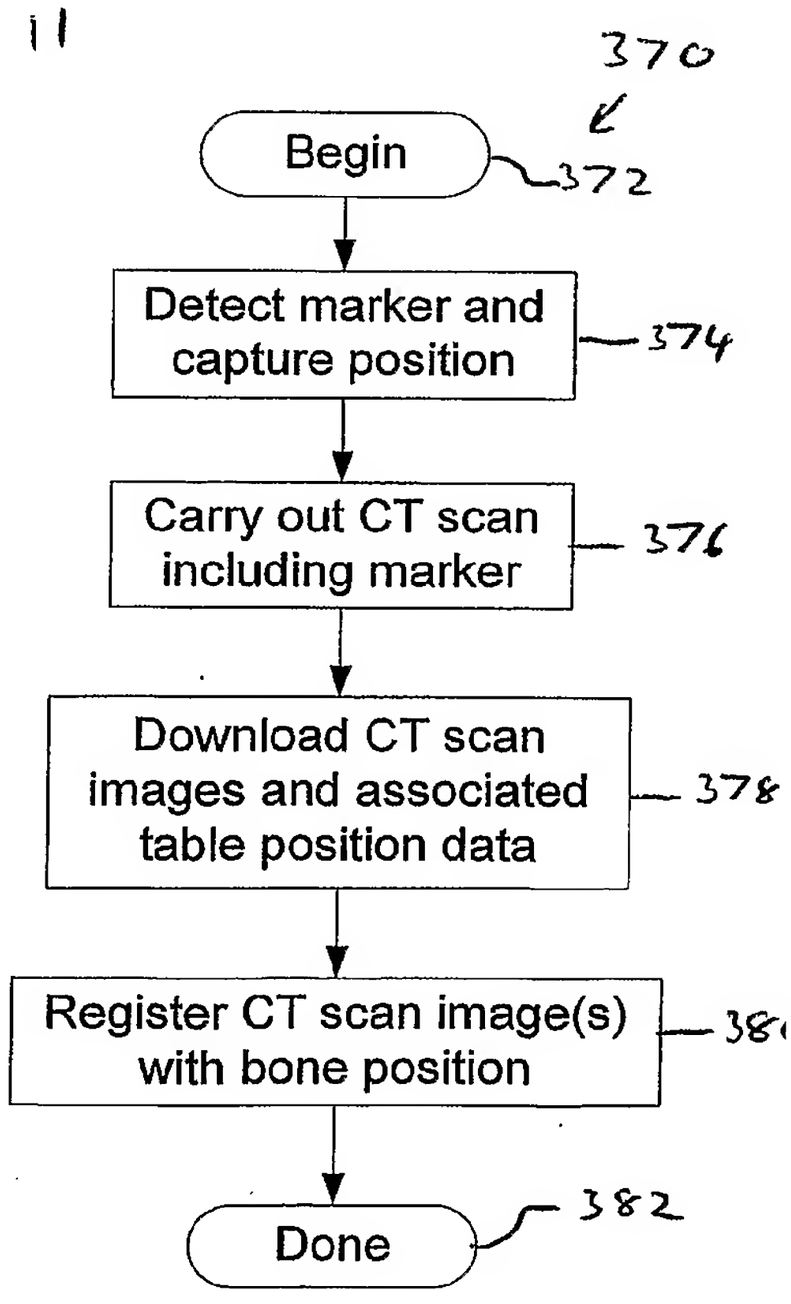


FIG. 12

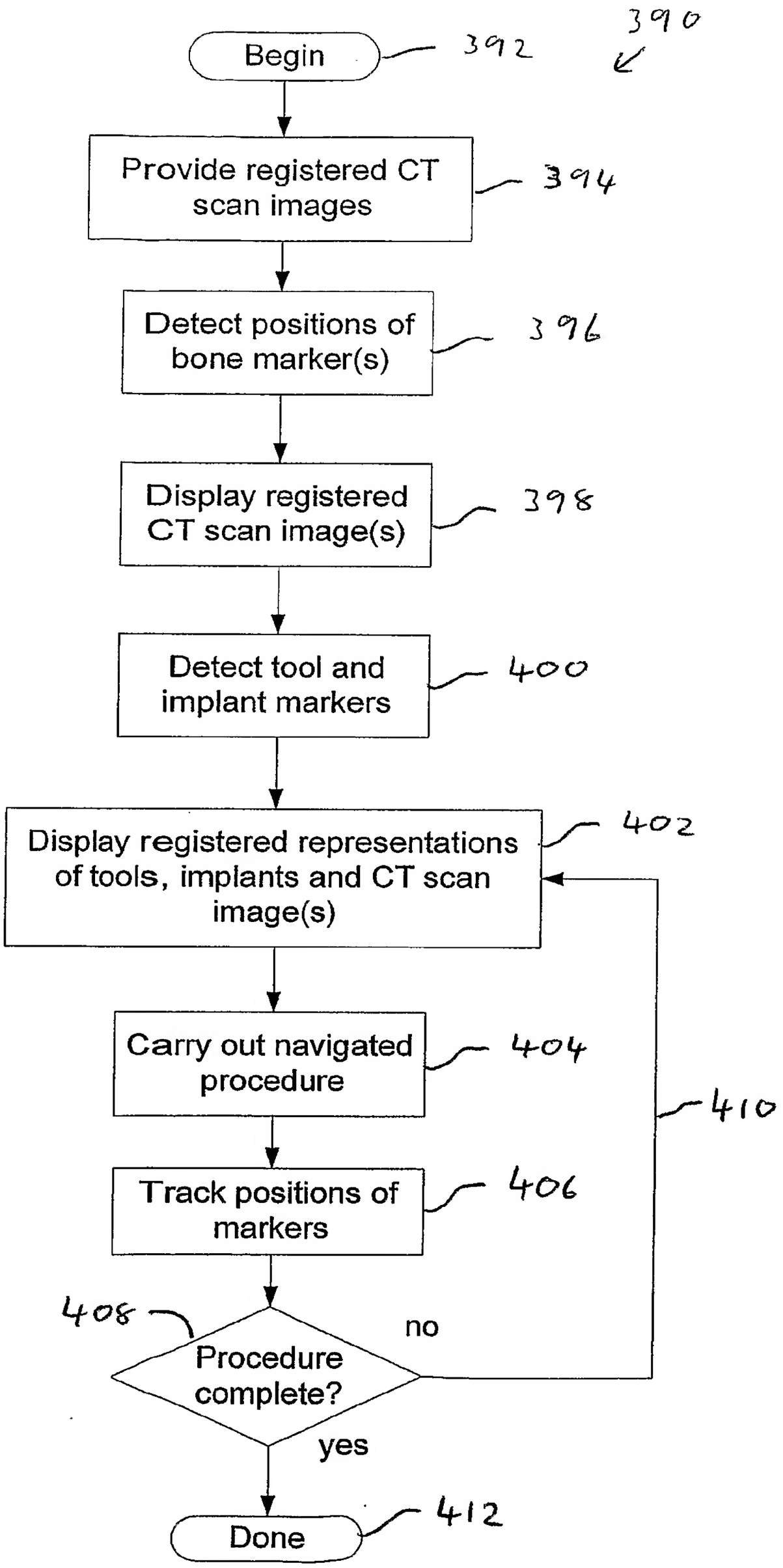

390
Begin
392
Provide registered CT scan images
394
Detect positions of bone marker(s)
396
Display registered CT scan image(s)
398
Detect tool and implant markers
400
Display registered representations of tools, implants and CT scan image(s)
402
Carry out navigated procedure
404
410
Track positions of markers
406
408
Procedure complete?
no
yes
Done
412

FIG. 13

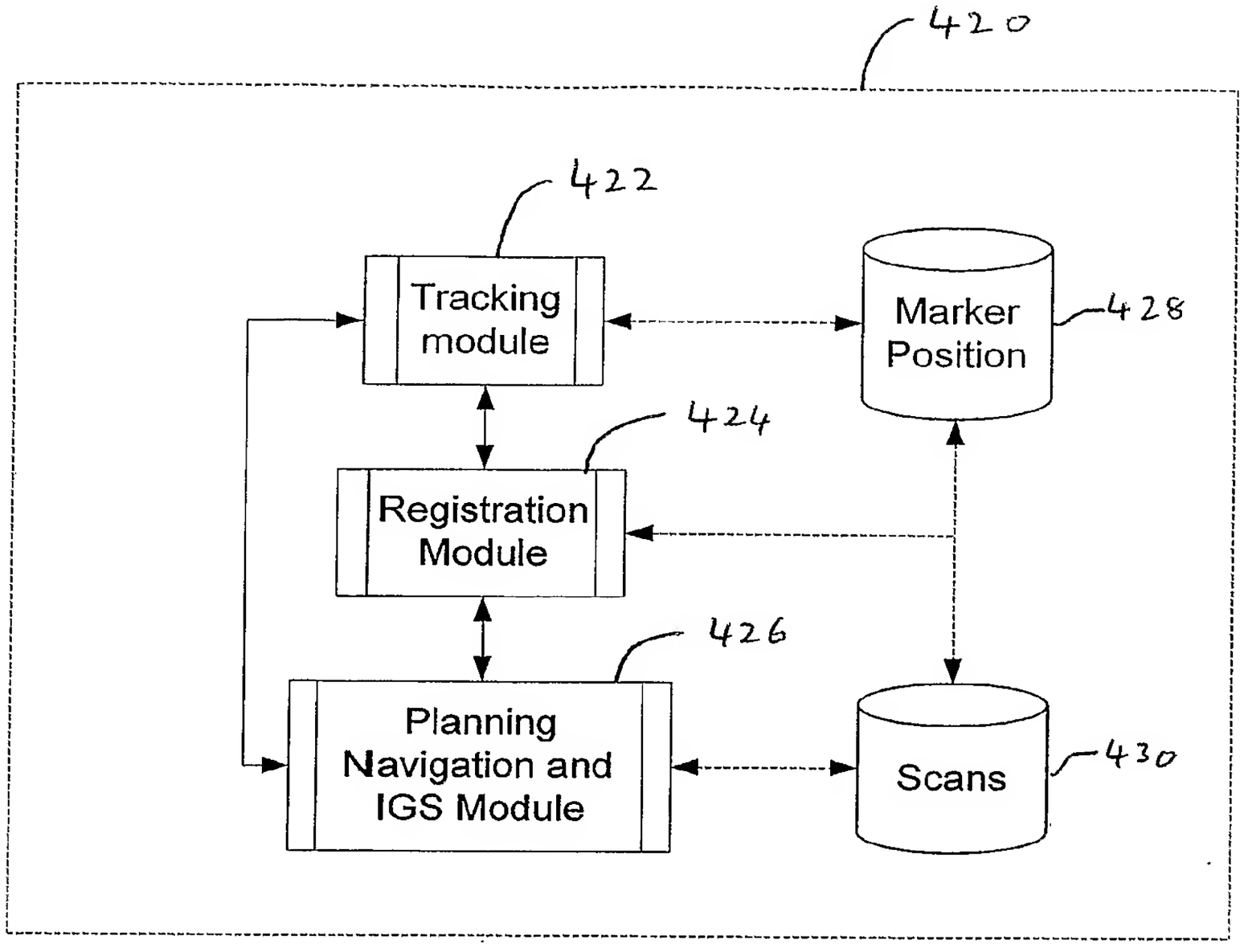

420
422
Tracking module
Marker Position
428
424
Registration Module
426
Planning Navigation and IGS Module
Scans
430

FIG. 14

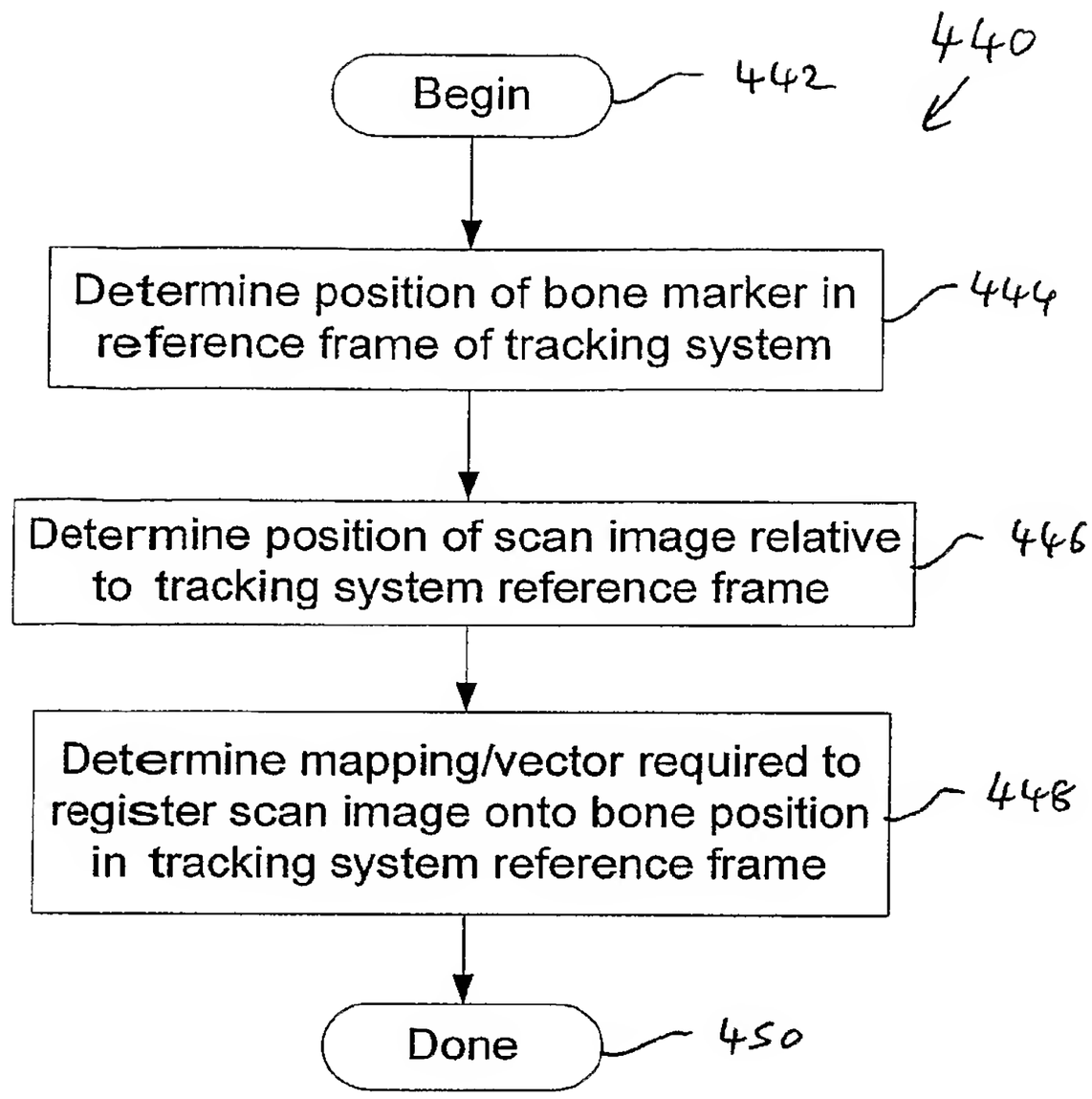

440
Begin
442
Determine position of bone marker in reference frame of tracking system
444
Determine position of scan image relative to tracking system reference frame
446
Determine mapping/vector required to register scan image onto bone position in tracking system reference frame
448
Done
450

FIG. 15

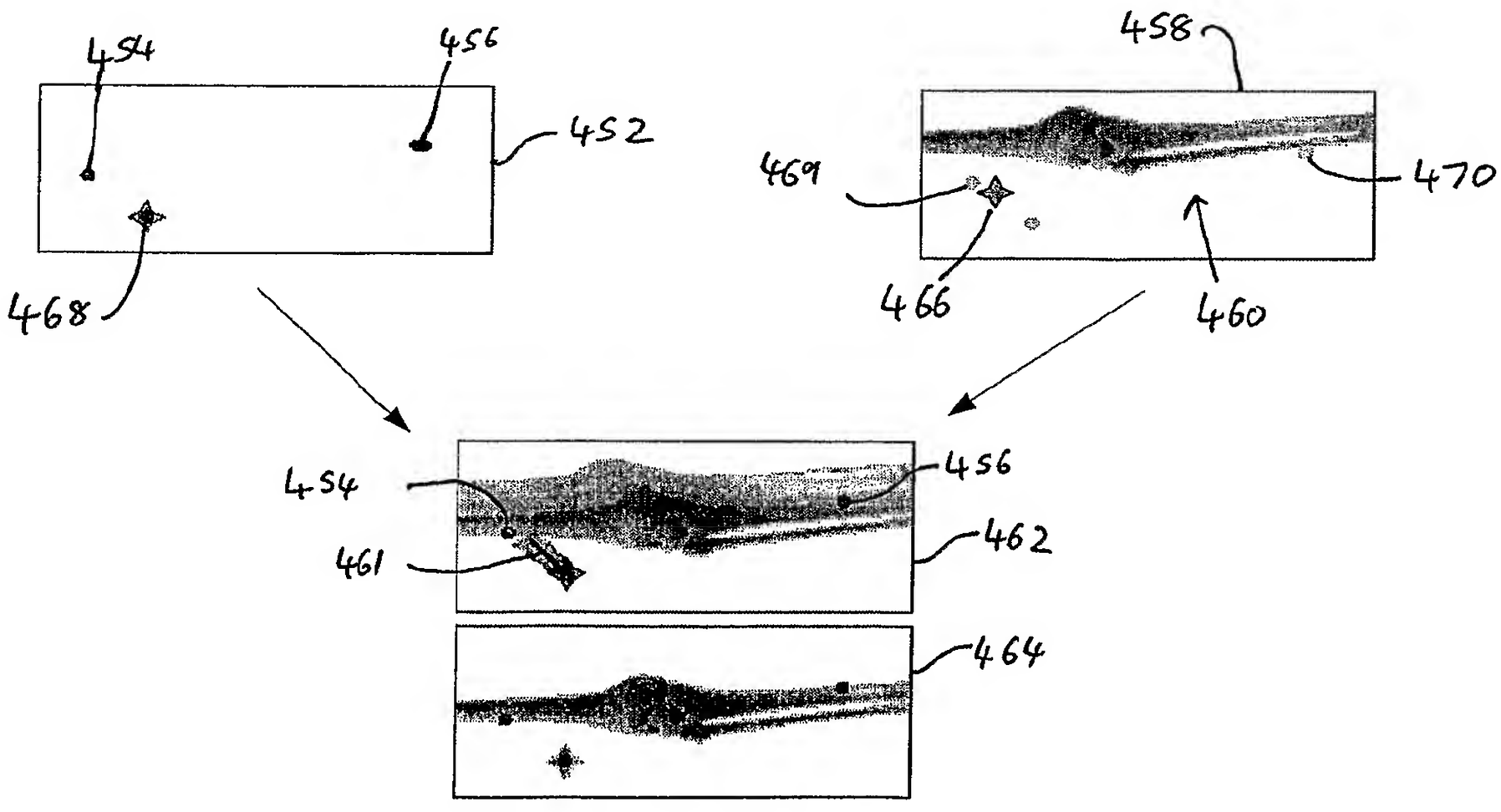
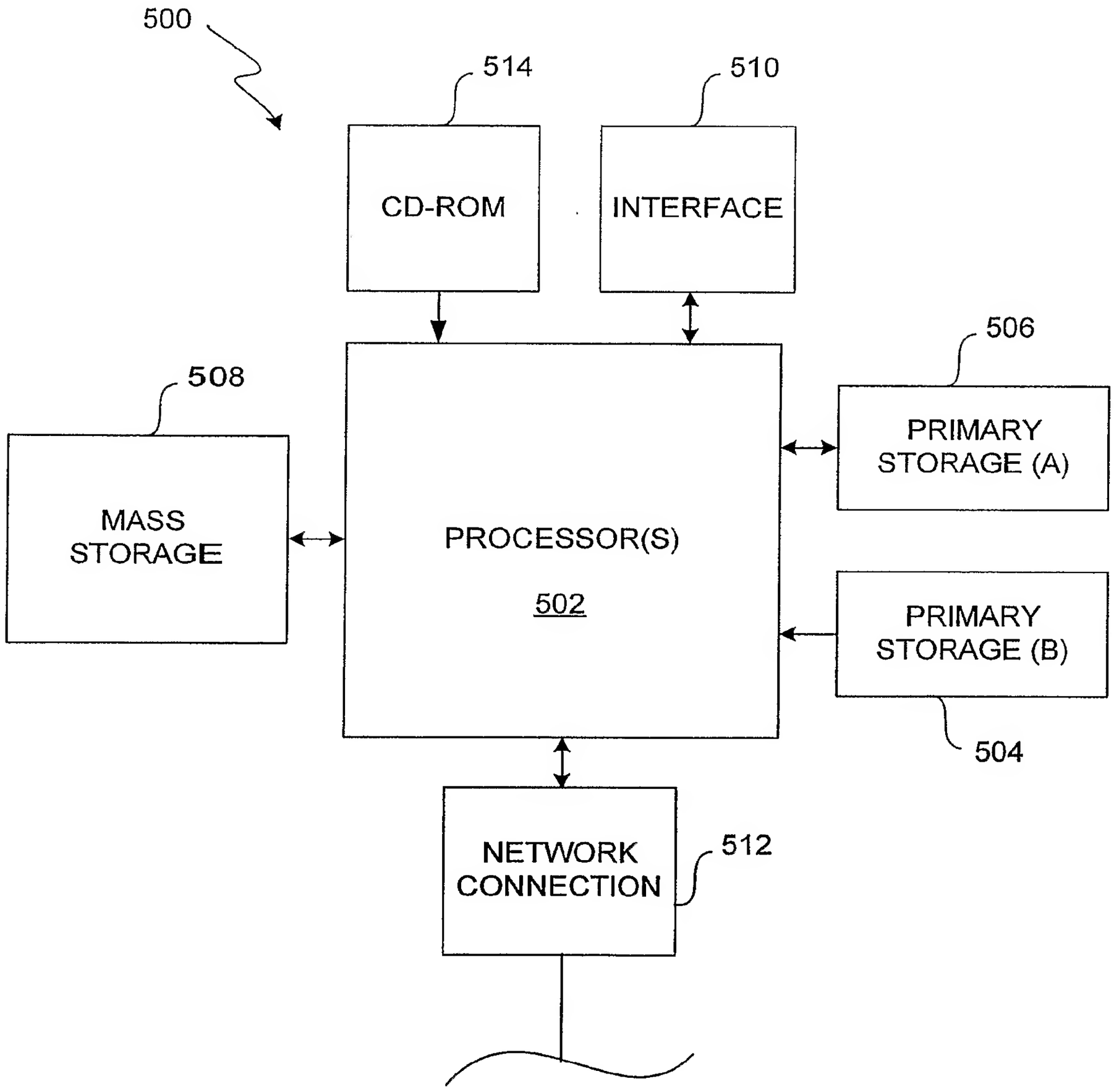

454
456
452
468
458
469
470
466
460
454
456
461
462
464

FIG. 16


500
514
510
CD-ROM
INTERFACE
506
508
PRIMARY STORAGE (A)
MASS STORAGE
PROCESSOR(S)
502
PRIMARY STORAGE (B)
504
NETWORK CONNECTION
512